a first, innermost, layer of $TiC_xN_yO_z$ with $x+y+z=1$ and [of claim 1 wherein the first, innermost, layer of $TiC_xN_yO_z$ has the composition] $z<0.5$ and $y<0.1$ with a thickness of 0.1-2 μm, and with equiaxed grains having a size <0.5 μm;

a layer of $TiC_xN_yO_z$ where $x+y+z=1$, and $z=0$, $x>0.3$ and $y>0.3$, with a thickness of 5-10 μm with columnar grains having a diameter of <2 μm;

a layer of $TiC_xN_yO_z$ where $x+y+z=1$, $z<0.5$ and $x>y$ with a thickness of 0.1-2 μm and with equiaxed or needle-like grains having a size <0.5 μm;

a layer of smooth, textured, fine-grained α-Al_2O_3 having a grain size of 0.5-2 μm with a thickness of 3-6 μm; and

an outer layer of $TiC_xN_yO_z$ where $x+y+z=1$, $z<0.05$ with a thickness of 0.5-3 μm and a grain size <1 μm, the outer coating layer having been removed in at least the edge line so that the Al_2O_3 layer is on top along the cutting edge line and the outer layer of $TiC_xN_yO_z$ is the top layer on the clearance side.

REMARKS

Entry of the foregoing, reexamination and reconsideration of the subject application in view of the amendments above and the comments which follow are respectfully requested.

As noted in the Office Action Summary, claims 1-7 were pending. Of those claims, claim 7 was withdrawn from further consideration as being to a non-elected invention. Claims 1-6 stand rejected on the grounds set forth in the Official Action.

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By this response, claim 3 has been amended.

RESTRICTION REQUIREMENT - AFFIRMATION OF ELECTION

Applicants hereby affirm the election of Group I, claims 1-6. As set forth in paragraphs 1-3 of the Official Action, election between claims 1-6 (a tool - classified in class 428, subclass 472) and claim 7 (a method - classified in class 427, subclass 255+) was required on the basis that the inventions described therein are related as a process of making and product made. It was further asserted that these related inventions were distinct on the basis that "the product can be made by a different process such as sputtering". Applicants traverse the restriction requirement.

As set forth in MPEP §803, there are two criteria for a proper requirement for restriction: (a) the claimed inventions must be independent or distinct, and (b) there must be a serious burden on the Examiner.

With regard to the second of the above criteria, it is submitted that the relationship between the inventions recited in claims 1-6 and 7 are such that examination of both inventions in the same application would not pose a serious burden on the Examiner. For instance, a thorough and complete search of either invention should encompass both classes 428 and 427.

REJECTIONS UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

In paragraph 6 of the Official Action, claim 3 was rejected under 35 U.S.C. § 112, second paragraph. In particular, it was asserted that "the value of z in claim 3 is

contradictory to the limitation in claim 1". By the present response, Applicants have placed claim 3 in independent form thereby obviating the above ground of rejection.

In paragraph 7 of the Official Action, claims 1-6 stand rejected under 35 U.S.C. § 112, second paragraph. In particular, it is asserted that in claim 1, "the value of x in the layers where y > x have not been defined rendering the claims indefinite". For at least the reasons set forth below, the rejection should be withdrawn.

First, it is noted that only the first inner most layer is defined in claim 1 as having y > x. As clearly set forth in claim 1, the value of x can vary within the parameters defined therein. Namely, the sum of x + y + z = 1 wherein y > x and z > 0.1. Contrary to the above assertion, x is defined, via its relationship to the other variables y and z.

There is nothing in 35 U.S.C. § 112, second paragraph which requires a numerical value to be assigned to a variable recited in a claim. The rejection is inappropriate and should be withdrawn.

REJECTIONS UNDER 35 U.S.C. § 102(b)

The present invention is directed to a cutting tool insert comprising a cemented carbide body which is coated.

The cemented carbide body comprises tungsten carbide having 5 to 10 wt. % cobalt and < 0.5 wt. % cubic carbides of metal from groups IVb, Vb, and VIb. The body comprises a highly W-alloyed binder phase having a CW-ratio of 0.75 to 0.93, and the

surface composition wherein the amount of cobalt on the surface is within +/ - 4 wt. % of the nominal cobalt content of the body.

The coating comprises a first innermost layer of $TiC_xN_yO_z$ with $x+y+z=1$ and $y>x$ and $z<0.1$. Alternatively, $x+y+z=1$, $z<0.5$ and $y<0.1$. The first layer has thickness of 0.1-2 μm. The first layer further includes equiaxed grains having a size <0.5 μm.

Another layer of $TiC_xN_yO_z$ is included in the coating. A composition of this layer such that $x+y+z=1$, $z=0$, $x>0.3$ and $y>0.3$. This layer has a thickness of 5-10 μm. This layer further having columnar grains of a diameter $<$ 2 μm.

The coating further comprises a layer of $TiC_xN_yO_z$ where $x+y+z=1$, $z<0.5$ and $x>y$. This layer has a thickness of 0.1 to 2 μm, and equiaxed or needle-like grains having size <0.5 μm.

The coating further comprises a layer of smooth, textured, fine grained α-Al_2O_3 with a grain size of 0.5-2 μm, and a thickness of 3-6 μm.

Finally, the coating comprises an outer layer of $TiC_xN_yO_z$ where $x+y+z=1$, and $z<0.05$. This layer has a thickness of 0.5 to 3 μm and a grain size of <1 μm. This outer coating layer is removed along at least the edge line so that the underlying Al_2O_3 layer is exposed along the cutting edge line, and this outer layer of $TiC_xN_yO_z$ is exposed as the top or exposed layer along the clearance side of the cutting tool insert.

Although claims 1-6 are rejected as being anticipated by 12 different references in the Official Action, none of the references disclose those features required by claims 1 and 3 of the present invention.

In paragraph 9 of the Official Action, claims 1-6 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Sandvik EP 0693574 (hereafter EP '574) or U.S. Patent No. 5,487,625 to Ljungberg et al (hereafter USP '625). For at least all of the reasons set forth below, withdrawal of this rejection is in order.

EP '574 discloses an aluminum oxide coated tool. The coating includes at least two refractory layers of which one of the layers is a fine grained α-Al_2O_3 layer which is exposed as the top layer along the cutting edge line. Similarly, USP '625 discloses a cutting tool body which is coated with one or more refractory layers. At least one of the layers including a fine grained layer of α-Al_2O_3 which is textured in the (012) direction.

Neither EP '574 nor USP '625 disclose a cemented carbide tool body which comprises a highly W-alloyed binder phase, a low content of cubic carbides, and a surface having a well-controlled amount of cobalt, as required by claims 1 and 3 of the present invention. Since these references fail to disclose at least the above-mentioned aspects of claims 1 and 3, the rejection is improper and should be withdrawn.

In paragraph 10 of the Official Action, claims 1, and 3-6 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 5,766,782 to Ljungberg et al. (hereafter USP '782), U.S. Patent 5,674,564 to Ljungberg et al. (hereafter '564), as well

as U.S. Patent 5, 652,045 to Nakamura et al. (hereafter USP '045). For at least the reasons stated below, withdrawal of the rejection is in order.

USP '782 discloses a cutting tool which includes a coating formed of a single or multiple layers of a refractory. The coating includes one or more layers of a fine grained α-Al_2O_3 that is textured in the (104) direction.

USP '564 discloses a sintered hard material at least partially coated with a wear resistant ceramic oxide. The coating is thicker along the edges than on the flat surface. The oxide coating exhibits a particular grain size.

Neither USP '782 nor USP '564 disclose a cemented carbide body comprising a highly W-alloyed binder phase with a well controlled amount of cobalt on the surface thereof, and a low content of cubic carbides, as required by claims 1 and 3 of the present invention. Since USP '782 and USP '564 fail to disclose at least these features of claims 1 and 3, the rejection should be withdrawn.

USP '045 discloses a surface coated tungsten carbide based cemented carbide body. The coating includes a first layer deposited on the cemented carbide body, a second layer deposited on a first layer, and a third layer deposited on the second layer. The first layer having a granular crystal structure, while the second layer has an elongated crystal structure. At least tungsten and cobalt are diffused from the body into the grain boundaries of the first and second layers of the coating.

The cutting insert of claims 1 and 3 includes a cemented carbide body. The body has a highly W-alloyed binder phase with a CW ratio of 0.75 to 0.93. USP '045 fails to

disclose a cemented carbide body having the above-described features required by claims 1 and 3.

Claims 1 and 3 of the present invention also recite a surface of the cemented carbide body being well defined such that the amount of cobalt on the surface is within +/- 4 weight% of the nominal cobalt content of the body. USP '045 fails to disclose a surface of the cemented carbide body having a controlled amount of cobalt within the claimed range.

With regard to the coating, claims 1 and 3 recite a layer of smooth, textured, fine grained α-Al_2O_3 having a grain size of 0.5 to 2 μm. While USP '045 discloses a third layer of Al_2O_3 having a thickness of between .1 to 15 μm, USP '045 is silent with regard to the texturing and grain size thereof. Therefore, USP '045 fails to disclose this aspect of claims 1 and 3 of the present invention.

Claims 1 and 3 also recite an outer layer of $TiC_xN_yO_z$ wherein this outer layer has been removed along at least the edge line so that the Al_2O_3 layer is exposed along the cutting edge line of the tool insert. While USP '045 discloses a third layer of Al_2O_3, and an optional outer fourth layer of TiN or TiCN is formed on Al_2O_3 layer, the disclosure of USP '045 is silent with regard to removal of the outer fourth layer to expose the Al_2O_3 along the edge line. Therefore, USP '045 fails to disclose this feature recited in claims 1 and 3 of the present invention. Therefore, for at least all of the reasons noted above, the rejection of claims 1 and 3-6 based on USP '045 is improper and should be withdrawn.

In Paragraph 11 of the Official Action, claims 1 and 3-6 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent, 5,135,801 to Nystrom et al.(hereafter

USP '801), EP 0 709 484 to Mitsubishi Materials Corp. (hereafter EP '484), EP 0 685 572 (hereafter EP '572), EP 0 594 875 (hereafter EP '875), English translation of JP 252 82-1978 and JP 6-10825 [sic: JP 6-108254] (hereafter JP '1978 and JP '254, respectively), and EP 0 653 499 to Sumitomo Electric Ind. Ltd.(hereafter EP '499).

USP '801 discloses a coated body wherein the coating comprises a first and second layer. The first coating layer being provided to reduce or eliminate carbon diffusion and formation of eta phase in the substrate.

USP '801 fails to disclose those features of the cemented carbide body required by claims 1 and 3. In addition, USP '801 fails to disclosure several of the features of the coating layers recited in claims 1 and 3. For example, claims 1 and 3 recites a layer of $TiC_xN_yO_z$ with columnar grains having a diameter of $< 2\ \mu m$. USP '801 fails to disclose such a coating layer. It is clear that USP '801 fails to disclose all features required by claims 1 and 3 of the present invention. Therefore the rejection is improper and should be withdrawn.

Reference EP '484 is equivalent to USP '045 discussed above. The rejection set forth in paragraph 11 of the Official Action should be withdrawn for the same reasons noted above in connection with the discussion of USP '045.

EP '572 discloses a coated hard alloy blade member having a substrate formed of WC based cemented carbide or a TiCN based cermet. A hard coating deposited on the substrate. The hard coating includes an inner layer of TiCN having unilaterally grown crystals of an elongated shape and an outer layer of Al_2O_3 having a crystal form χ or $\chi+\alpha$

where an $\chi > \alpha$. At least the following differences can be seen between the cutting tool insert of claims 1 and 3 and EP '572.

With regard to the body, EP '572 fails to disclose a highly W- alloyed binder phase having a CW ratio of 0.75 - 0.93. EP '572 fails to disclose a cemented carbide body having a surface composition such that the amount of cobalt on the surface is within +/- 4 weight% of the nominal cobalt content of the cemented carbide body.

With regard to the coating, EP '572 fails to disclose a textured fine grained α-Al_2O_3 layer as recited in claims 1 and 3. The Al_2O_3 layer disclosed in EP '572 is predominantly χ phase Al_2O_3. EP '572 also fails to disclose removal of the Al_2O_3 layer along the edge line of the cutting tool surface thereby exposing the Al_2O_3 as the outer most layer in this region, while a layer of $TiC_xN_yO_z$ is left as the top layer along the clearance side of the cutting tool. EP '572 fails to disclose a first inner most layer of $TiC_xN_yO_z$ as recited in claims 1 and 3 with equiaxed grains having a size less than 0.5 μm. The first inner most layer of EP '572 is disclosed as having crystals which are unilaterally grown and elongated in shape.

Therefore EP '572 fails to disclose at least the above-mentioned elements of claims 1 and 3. The rejection should be withdrawn.

EP '875 discloses a tungsten carbide base cutting tool having a sintered hard alloy substrate material provided with a multiple layer coating. The substrate has a surface area which is substantially free of carbides, carbonitrides and nitrides of TiTa and Nb. The coating consists essentially of a primary coating to TiCN deposited on the surface of the

substrate, a secondary coating of Al_2O_3 deposited on the primary coating, and a surface coating consisting essentially of one coating of TiCN and Tin deposited on the Al_2O_3 layer.

EP '875 fails to disclose various features recited in claims 1 and 3 of the present invention. With regard to the cemented carbide body, EP '875 fails to disclose a highly W-alloyed binder phase having a CW ratio of 0.75 to 0.93.

With regard to the coating, EP '875 fails to disclose a first inner most layer of $TiC_xN_yO_z$ with equiaxed grains, a layer of $TiC_xN_yO_z$ with columnar grains, and a layer of smooth, textured fine grained α-Al_2O_3. Moreover, EP '875 fails to disclose removal of an outer layer of $TiC_xN_yO_z$ along the edge line of the cutting tool so as to expose the Al_2O_3 layer in this area.

For at least the reasons noted above, the rejection based on EP '875 is improper and should be withdrawn.

The English language translation of JP '1978 discloses a coated cutting tool material. The coating includes multiple layers the first of which is a layer of Fe, Ni, or Co which has high ductility. In contrast, the present invention clearly recites a first inner most layer of $TiC_xN_yO_z$.

The English language translation of JP '1978 fails to disclose a layer of $TiC_xN_yO_z$ with columnar grains having a diameter of $< 2\ \mu m$. Finally, JP '1978 fails to disclose an outer layer of $TiC_xN_yO_z$ which has been removed along the edge line of the cutting tool to expose the underlying layer of α-Al_2O_3 in this region. For at least the reasons noted above, the rejection is improper and should be withdrawn.

JP '254 discloses a cutting tool formed of a tungsten carbide based sintered alloy substrate provided with a coating thereon. The coating includes multiple layers. The particular features of the tungsten carbide cutting tool body recited in claims 1 and 3 of the present invention are not disclosed in JP '254. Moreover, various aspects recited in claims 1 and 3 with regard to the coating applied thereon are also missing from the disclosure of JP '254. For example, JP '254 fails to disclose an outer layer of $TiC_xN_yO_z$ which is removed along the edge line of the cutting tool to expose an underlying surface of textured, fine grained α-Al_2O_3 having a grain size of .5 - 2 μm and a thickness of 3 - 6 μm. For at least the reasons noted above, the rejection is improper and should be withdrawn.

EP '499 discloses a coated tungsten carbide base cemented carbide body for use as a cutting tool. The coating layer comprises an internal layer and an external layer, wherein the internal layer consist of a single layer of titanium carbonitride in contact with the base material. The coating layers are deposited by MT-CVD with a low content of chlorine and special crystallographic properties expressed as X-ray diffraction intensity ratios.

EP '499 fails to disclose cemented carbide body having the claimed properties. For instance, EP '499 fails to disclose a highly W-alloyed binder phase having a CW ratio of 0.75 - 0.93 and a surface composition such that the amount of cobalt on the surface being within +/- 4 weight% of the nominal cobalt content of the cemented carbide body.

EP '499 also fails to disclose the coating described in claims 1 and 3 of the present invention. For instance, EP '499 fails to disclose a first inner most layer of $TiC_xN_yO_z$ with equiaxed grains having a size $< 0.5\mu$m, a layer of $TiC_xN_yO_z$ with columnar grains having

a diameter of $< 2\ \mu m$, a layer of smooth, textured, fine grained α-Al_2O_3 having a grain size of .5 - 2 μm, and an outer layer of $TiC_xN_yO_z$ which is removed in the area of the edge line of the cutting tool thereby exposing the underlying $TiC_xN_yO_z$ layer.

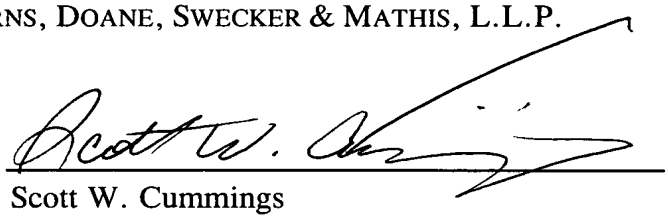
For at least the reasons noted above, EP '499 fails to disclose all features of the claimed invention. Therefore the rejection is improper and should be withdrawn.

CONCLUSION

Based on the foregoing, further and favorable action in the form of a Notice of Allowance is earnestly solicited. Should the Examiner feel that any issues remain outstanding, it is requested that the undersigned Attorney be contacted so that any such issues may be addressed by way of Supplemental Amendment or Examiner's Amendment, and the prosecution of the instant application expedited.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: 

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